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SURGICAL AND NON-SURGICAL TREATMENT
OF THE PROSTATE GLAND*

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INTRODUCTION

ONE out of every four men over the age of 70 years has some deviation from the normal as regards the anatomical structure of the prostate gland. This fact was established by the author in a series of 250 consecutive autopsies on males at Bellevue Hospital. In addition, the prostate is subject to attack by various organisms in youth and young manhood, adding to the general incidence of prostatic disease. In later years, adenomatous hypertrophy and carcinoma and other malignancies enter the picture. The prostate gland is, therefore, an organ of considerable importance from the pathological standpoint, and must be reckoned with at all ages after puberty—and, indeed, even before puberty because sarcoma of the prostate occurs at any age.

ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS

The prostate gland consists of five lobes: two lateral, a middle, an anterior and a posterior. There are two accessory structures: (1) the

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subcervical group of tubules, occurring under the mucosa at the vesical orifice, and (2) Homes' gland, located in the mucosa of the middle of the trigonum vesicae. The various lobes of the gland send their ducts (averaging 63 in number) to open into the posterior urethra.

In adult life, the prostate is normally about as large as an English walnut. Located at the neck of the bladder, in a particularly strategic position for causing obstruction, even slight disturbances in the prostate assume exaggerated proportions.

The only proved function of the prostate gland is the production of a chemical substance which dilutes the testicular and seminal vesicular secretions and separates and activates the spermatozoa. The formation of an internal secretion has not been proved.

INJURIES TO THE PROSTATE GLAND

The prostate is well protected, but may be injured by external violence with fracture of the symphysis. More common are operative injuries and internal traumatism resulting from instrumentation.

DISEASES OF THE PROSTATE GLAND

PROSTATITIS

Prostatitis is a very common disease. It is usually associated with inflammation of the posterior urethra, seminal vesicles, vesical neck, trigone, or even the epididymes, and should, therefore, be studied in relation to both the urinary and genital tracts.

1. ACUTE PROSTATITIS

Etiology and Bacteriology. The most frequent cause of acute prostatitis is gonococcal infection. Non-specific acute infections are also common and have of late received much study. The organisms most often responsible are the *Staphylococcus albus* and *aureus*, *Streptococcus pyogenes*, and colon bacillus, but the *Bacillus proteus*, diphtheroid types, or other organisms may be present. Mixed infections are frequent. Contributing causes of prostatitis are masturbation over a protracted period, excessive sexual excitation without gratification, excessive sexual intercourse, and coitus interruptus.

Infection may reach the prostate by direct extension from the posterior urethra up the prostatic ducts (the most common way); or it may be descending, and secondary to an acute infection of the kidney or

bladder; or blood-borne, from a primary focus in the sinuses, teeth, or tonsils; or a complication of a systemic infection, such as influenza. A chronic prostatitis may be exacerbated into an acute condition by unwise instrumentation and manipulation in the treatment of chronic posterior urethritis and prostatitis.

Pathology. Three types of acute prostatitis are recognized: (1) acute catarrhal inflammation, which is always present in acute posterior urethritis and is usually caused by direct migration of the organisms up the prostatic tubules; (2) follicular prostatitis, which follows the first type and is characterized by many small abscesses and distention of the tubules with pus, which is not evacuated because of obstruction of the ducts; (3) parenchymatous prostatitis, an intensification of the second stage, the suppurative foci involving a greater extent of the surrounding stroma.

The termination of acute prostatitis is resolution, the formation of a large prostatic abscess, or chronic prostatitis.

Symptoms. The onset of acute prostatitis may be mild, with few or no local symptoms; or it may be very severe. When of urethral origin, the initial symptoms are usually disturbances of urination: urgency, frequency, burning, pain during urination, dribbling. The prostate may enlarge to the point of causing complete retention, requiring catheterization. In acute prostatitis of hematogenous origin, the attack may be ushered in by a chill or fever, and there may or may not be urinary symptoms. Pain may vary from a sense of fulness in the perineum or rectum to acute pain—in the perineum, rectum, loins, penis, or above the pubes. There is leukocytosis.

Diagnosis. Mild prostatitis is likely to escape observation during the course of acute gonorrhea. In severe cases, rectal palpation of a symmetrically enlarged, hot, tender gland is sufficient, with the symptoms and the findings of the two-glass urine test, to establish a diagnosis.

Treatment. Treatment of acute prostatitis is expectant, and consists in absolute rest in bed for all febrile cases; avoidance of physical strain and sexual excitation; avoidance of trauma to the gland; the application of heat in the form of hot sitz baths, hot rectal irrigations, or diathermy; sedatives and belladonna and opium suppositories for pain; alkalization of the urine, and forced fluids if there is no urinary retention. With acute retention, catheterization may be necessary. Massage of the prostate and urethral instrumentation are contraindicated in the acute stage.

In addition to the above methods for symptomatic relief, chemotherapy has proved of great value in shortening the acute stage of prostatic infections. Sulfanilamide is a most useful drug in combating both gonococcal and non-specific infections. In bacillary infections, mandelic acid, and methenamine and sodium acid phosphate, are valuable.

2. CHRONIC PROSTATITIS

Chronic inflammation of the prostate gland is a very common condition in adult males. In our series of 350 postmortem studies, a large number of the specimens showed evidence of inflammation of the prostate.

The chronically infected prostate is a common focus of infection, and urologists have repeatedly emphasized the importance of examining the gland and its secretion when searching for the source of obscure infectious conditions. We regard the prostate as second only to infected tonsils as a cause of arthritis. It may also be responsible for endocarditis, neuritis, iritis, and myositis.

Etiology and Bacteriology. Chronic prostatitis may result from any cause which congests the gland, such as long-standing infection, sexual abuse, or instrumental or other trauma. Other possible etiological factors are prostatic calculosis, stricture of the urethra, and certain vitamin deficiencies and endocrine dyscrasias.

Chronic prostatitis is most frequently the sequel to an acute infection, which may be caused by either the gonococcus or other organisms. The incidence of acute prostatitis as a complication of gonorrheal urethritis has been variously estimated at from 50 to 90 per cent; and untreated acute gonorrheal prostatitis, or incompletely treated posterior urethritis, is undoubtedly the most important factor in the production of chronic prostatitis. Only immediately after the acute inflammation has subsided is the gonococcus to be found in the prostatic strippings.

Chronic inflammations are by no means always due to the gonococcus, however. Non-specific infection is common, and may be a direct extension from the urethra; or blood-borne from a focus in the tonsils, teeth, or sinuses; or the aftermath of an acute systemic infection. The most common organisms demonstrated are the colon bacillus and the staphylococcus, streptococcus and their subforms.

Pathology. Microscopically, there are usually to be observed regions of inflammatory reaction in and about the acini, characterized by an

increase of the polymorphonuclear cells, lymphocytes, and plasma cells, with marked proliferation of connective tissue. In other cases, the micro-pathological changes consist in circumscribed areas of round cell or polymorphonuclear cell infiltration. Minute abscesses are sometimes observed.

In a large percentage of cases, cystoscopic examination will show pathological changes in the region of the bladder neck, trigone, or posterior urethra. There is usually more or less involvement of the seminal vesicles, which may be soft and atrophic, or enlarged and indurated.

Symptoms. The signs and symptoms of chronic prostatitis vary greatly. The most frequent complaints are of pain, a urethral discharge, which may be profuse or merely the so-called "morning drop," and some disturbance of sexual function, always accompanied by neurasthenia. The pain may be local or referred. Ordinarily, it is located in the perineum, and may be described by the patient simply as a "heaviness" in the rectum. With this type there is generally a history of the passage of prostatic fluid on defecation. The pain may be referred down the back or inner sides of the legs, or into the groins, penis, or sacrum; or it may simulate that produced by renal or ureteral stone. Frequent and painful urination, urgency, and difficulty are all common complaints, and result largely from involvement of the posterior urethra and bladder neck. If abscess occurs in the course of a chronic prostatitis, which is not uncommon with pyogenic infections, there is increased leukocytosis and pain, chills, and a rise in temperature.

Frequently the predominant symptoms are metastatic, with absence of local symptoms, so that the prostate is not suspected.

Diagnosis. The diagnosis of chronic prostatitis should be based on (1) rectal palpation, (2) repeated analyses of the voided urine, (3) microscopic examination of the prostatic secretion and ejaculate, and (4) urethroscopic examination of the posterior urethra and vesical neck. It is often wise to delay this last procedure until the most distressing symptoms have been allayed by treatment.

Rectal palpation, though of the greatest importance, is not of itself sufficient to establish the diagnosis of chronic prostatitis since, not infrequently, palpation of the chronically inflamed gland may reveal no gross changes, yet pus cells will be found in the prostatic strippings. Many a prostate that feels normal functions poorly and contains large

amounts of pus and debris, and many microorganisms.

Often, however, careful rectal palpation will reveal changes in and about the gland. It will be hard and nodulated, and usually adhesions can be felt extending from its lateral borders to the seminal vesicles and adjacent pelvic tissues. Such a prostate is ordinarily, but not always, enlarged, and sometimes there are boggy spots between the areas of induration. Areas of normal gland are usually present.

Microscopic examination of the prostatic fluid, expressed by massage, is the only reliable method of demonstrating the presence of infection in the gland. Often the diagnosis must rest solely on microscopic evidence of pus in the expressed secretions. In treating a case of chronic prostatitis, frequent microscopic examinations of the unstained prostatic fluid should be made, as the conditions present in the gland can be ascertained in this way much more accurately than by palpation. Negative findings on one examination of prostatic secretion are, however, insufficient proof of the absence of prostatitis, since pus in some instances does not make its appearance until after the prostate has been massaged from two to five times. The secretion expressed from the first massage may be from normal portions of the gland, and two or more manipulations may be necessary to open a pathway into the urethra from a closed-off focus of infection. Massage for diagnostic purposes must, of course, be carried out firmly enough to express the secretions, but very gently and cautiously; otherwise, epididymitis may result. The prostatic fluid should be stained at least once to ascertain the presence or absence of bacteria, and their type. Bacteria are more readily identified on smear than in culture, but many of the more chronic cases fail to show bacteria either on smear or in culture.

To secure uncontaminated prostatic secretion the patient is first asked to void his urine; the penis and meatus are cleansed with green soap and water; and the anterior urethra irrigated with rivanol dextrose, acriflavine, or other antiseptic solution. The patient kneels on the table and a small endoscopic tube is inserted to a point beyond the external sphincter into the prostatic urethra. He then bends over and rests on his hands or elbows. The prostate is massaged firmly but gently and finally the prostatic urethra emptied by vigorous strokes down the middle depression of the prostate. The uncontaminated prostatic fluid is received in a sterile test-tube which the assistant holds at the end of the endoscope.

Normal prostatic fluid is opalescent and viscid, and microscopically is seen to consist of corpora amylacea, lecithin globules, columnar epithelia, and occasional hyaline globules. In chronic prostatitis, the prostatic secretion is less opalescent than the normal fluid, and the normal elements are replaced by pus cells and degenerated epithelial cells. The degree of infection is measured by the amount of pus in relation to the lecithin. In well-developed chronic prostatitis much of the lecithin content will be replaced by pus cells, often in clumps. As the condition improves, the pus cells diminish and the normal elements reappear. Bacteria may be present in great numbers.

Urethroscopic examination of the posterior urethra is advisable in cases where palpation of the prostate and vesicles, analysis of the voided urine, and microscopic examination of the secretions have proved inconclusive. The marked chronic inflammatory changes that may be revealed by such examination not infrequently are the only clue to a low-grade prostatitis and vesiculitis.

Prognosis. The patient suffering from long-standing prostatitis is not easily cured and it is advisable so to inform him at the outset of treatment. Relief of symptoms by some form of therapy, especially urethral dilatation, massage, rectal heat, and chemotherapy, is possible in most cases; but reversion to a normal prostatic fluid is more difficult to obtain and requires complete removal of infectious foci and restitution of prostatic drainage.

Treatment. In general, treatment consists of dilatation of the prostatic urethra, prostatic massage, urethrovesical irrigations and instillations, heat applied in the form of hot rectal irrigations, hot sitz baths, or diathermy, chemotherapy, and hyperpyrexia and vaccine therapy in selected cases.

The elimination of distant foci of infection, in the tonsils, teeth, sinuses, or colon, is of the greatest importance. In these cases, local measures are useful in relieving the symptoms, but are of little value in cure of the prostatitis, which is dependent upon removal of the primary focus.

The main problem in the treatment of chronic prostatitis is the restitution of free drainage, since retention favors infection. The most effective method of restoring the potency of prostatic and ejaculatory ducts is by a gradual, gentle, but thorough *dilatation of the prostatic urethra* to its maximal capacity. Urethral dilatation should precede mas-

sage of the partially or totally retentive gland since massage is beneficial only when drainage can take place through patent ducts. Active instrumentation is permissible in most cases at the time of the first consultation, the only clinical requirement being a clear first glass of urine. Dilatation is best carried out by means of sounds (passed upon a bladder partly filled with a mild antiseptic solution). Dilatation is carried on two or three times a week until the largest possible sound has been passed on at least three occasions and has remained tight, indicating that the maximal capacity of the urethra has been reached. The voided urine should be examined before each instrumentation, and treatment discontinued whenever the urine becomes cloudy. A mild urethritis may develop when the occluded ducts resume drainage and empty their infectious contents into the urethra. It may then be necessary to employ urinary antiseptics: sulfanilamide, mandelic acid, salol, or methenamine with acid sodium phosphate—their selection depending upon the nature of the infecting organism. Clinical proof of improved drainage can be obtained by a comparison of the amount and composition of the secretion before and after dilatation.

When satisfactory drainage of the diseased prostate has been restored, *digital massage* may be given once or twice a week upon a bladder partly filled with antiseptic solution. The aims of prostatic massage are: (1) the gentle expression of the accumulated secretion, (2) a stimulation of the contraction of smooth muscle fibers, and (3) the stretching and final removal of marginal adhesions. The technique, as well as the results obtained, vary widely with different operators. The patient may stand with the body bent forward, as over the back of a chair, or be placed in the Sims' position, or he may rest upon his knees and elbows. The operator, with his gloved index finger in the rectum, exerts gentle pressure upon the lobes palpable from that position, using a downward stroking motion with the force directed toward the urethra, the object being to empty the prostatic acini of their purulent contents and to break up adhesions about the gland. Secretions later may be expressed from the ejaculatory ducts and the sinus pocularis by bringing the firmly pressing finger downward along the posterior urethra. Most patients with chronic prostatitis are benefited by intelligent application of prostatic massage; but too early, too vigorous, too frequent, or unduly prolonged massage may cause acute epididymitis or other unfavorable reactions. The degree of pressure is a matter of experience and is gov-

erned largely by the degree of inflammation present. As a rule, massage is carried out twice a week at first—the treatments tapering off, as the condition improves, until the patient is receiving massage once a week, then every ten days, semi-monthly, and finally once a month.

Hyperpyrexia and vaccines, serums, and injections of foreign proteins have a limited usefulness. *Hyperpyrexia* has been found highly beneficial in certain severe cases of gonorrhea and in the treatment of most gonococcal complications, but it is expensive, very uncomfortable, and attended with considerable risk. We have found *vaccines* very helpful in certain cases of arthritis where the infective focus was in the prostate, but in other cases their use has resulted in no appreciable benefit. *Intraprostatic injections* of antiseptic solutions have been recommended for recalcitrant pyogenic prostatitis; our experience has been that the benefits are not sufficient to offset the hazards of this method.

Chemotherapy has given a new hope in the treatment of chronic prostatitis, with the introduction of the sulfonamides and mandelic acid. Other useful drugs are salol and methenamine used with acid sodium phosphate. When prostatic pain is very severe, sedatives are often necessary. The barbiturates usually suffice, but occasionally it is necessary to give codeine, pantopon, or morphine. When there is pain in the region of the prostate, or during micturition, the patient should be given a soothing prescription, such as Kirwin's mixture:

Potassium citrate	Drams	VI (24 cc.)
Tinct. Hyoscyami	Ounces	I (30 cc.)
Tinct. Opii camphorata	Ounces	I (30 cc.)
Elix. Saw palmetto et Santalwood		
q.s. ad.	Ounces	IV (120 cc.)

Sig:—Drams II (8 cc.) q. 4 hours

Spices and alcohol should be eliminated from the diet and constipation avoided. When there is marked vesical irritation, a restricted diet should be used, which limits meat, tea and coffee, and eliminates certain foods which are irritating to the bladder, such as asparagus, carrots, tomatoes, berries.

The application of heat to the inflamed prostate has definite therapeutic value. Relief may often be obtained by hot sitz baths, hot rectal irrigations, diathermy, or radiothermy. The Elliott treatment regulator, introduced through the rectum, is an effective method of applying dry heat directly to the prostate and adjacent structures.

Occasionally a prostate becomes so infected that no amount of treatment by these methods will effect a cure. Total prostatectomy is then indicated.

PROSTATIC ABSCESS

Etiology. Abscess of the prostate gland may follow failure of an acute diffuse parenchymatous prostatitis to subside or to become chronic. Multiple small abscesses in the stroma coalesce to form one large abscess. A frequent cause is the gonococcus, but our own studies have shown that many other organisms may be present in abscess cavities in the prostate. Prostatic abscess may result from improper instrumentation; or occur as a complication of systemic infection; or be secondary to superficial pyogenic infections, such as carbuncles, boils, and felons. In the last event, the causative organism is the *Staphylococcus aureus*.

Symptoms and Diagnosis. The symptoms are pain in the perineum, chills, fever, and frequent and painful urination which may progress to complete retention. Leukocytosis is present. Chronic abscess may persist for weeks without producing local symptoms. There are occasional cases of huge prostatic abscesses in which the only symptom is difficulty of urination; this is due to the type and lack of toxicity of the infecting organism.

The diagnosis usually is not difficult. By rectum, the prostate is felt to be enlarged, hot, tender, and often asymmetrical. The presence of fluctuation is conclusive. If no fluctuation is detected, a needle may be inserted into the suspected area and pus withdrawn, if present. If neither fluctuation nor pus is noted, a cysto-urethrogram may be helpful.

Prognosis and Treatment. An untreated prostatic abscess may rupture into the urethra or rectum, or burrow into the perineum, bladder, or even the peritoneum, with dire results. Abscesses which empty their entire contents into the urethra are likely to be of the follicular type, or at least not deeply seated in the parenchyma. Spontaneous evacuation through the rectal wall is a surgical calamity.

If proper drainage is instituted, convalescence is usually satisfactory, although every case must be followed by a period of observation and treatment to insure a normal gland.

Evacuation of a prostatic abscess *through the posterior urethra* is the method of choice. A perineal section is done, the finger introduced into the prostatic urethra, and the honey-combed interior cleaned out

so that no pockets remain. A tube is then introduced into the bladder, diverting the urine and conducting the pus out through the perineal wound.

Evacuation may also be accomplished *from outside the urethra*. The posterior surface of the prostate is exposed as in a Young perineal prostatectomy, the abscess incised, and a tube inserted into it and fixed in position. The transvesical route is occasionally employed, but our own experience with it has not been encouraging.

SYPHILIS OF THE PROSTATE GLAND

Syphilis of the prostate appears to be exceedingly rare. We have personally never encountered a case, and very few have been reported in the literature.

Symptoms and Diagnosis. There is nothing pathognomonic either in the symptoms or the rectal findings. The chief symptom is perineal pain, usually aggravated by urination. Less common are hematuria, pain on defecation or coitus, urinary disturbances, and retention. Prostatic massage usually produces a more or less characteristic discharge. On rectal palpation the prostate will be found markedly irregular, enlarged, and sometimes nodular. The Wassermann test is usually positive.

Prostatic syphilis is a late manifestation of lues, and occurs, usually, between the ages of 40 and 65 years, when it may be very difficult to differentiate it from hypertrophy of the prostate and carcinoma.

Prognosis and Treatment. If diagnosed early, the disease responds readily to antiluetic treatment; if unrecognized, the prostate may be destroyed by gummas.

Treatment consists of the usual antiluetic measures, reinforced by surgical drainage of necrotic gummas.

TUBERCULOSIS OF THE PROSTATE GLAND

Etiology and Incidence. Tuberculosis of the prostate is a disease of the young adult and, as a rule, is observed in those in the third and fourth decades of life. It is almost always a secondary involvement in a progressive tuberculosis which is extending throughout the urogenital system. In most instances it is probably an extension from the seminal vesicles. Between 50 and 70 per cent of all cases of tuberculosis of the male genital tract show involvement of the prostate.

Pathology. At first the prostatic lesion may be confined to the region

about the ejaculatory duct on the side corresponding to the infected vesicle, whence it spreads, by way of the acini or the lymphatics, to other parts of the gland. In the rare cases in which the prostate is infected by tubercle bacilli conveyed in the urine, the initial lesion is periurethral.

The first pathological change is the formation of tubercles. The tubercle bacilli are apparently first deposited in the walls of the small capillaries. Other tubercles develop from these original foci and extend in the usual manner. Later stages are fibrosis, caseation, and suppuration. Suppuration may result in rupture of an abscess through the prostatic capsule, with the formation of an intractable perineal fistula; or there may be rupture into the urethra. Spontaneous healing is rare. Small caseous areas may become encapsulated and latent, or they may undergo calcification and encapsulation.

Symptoms and Diagnosis. With well-walled-off tubercles, there may be no untoward symptoms whatsoever. If the tubercles have coalesced and finally ruptured into the urethra, there will be frequency, dysuria, hematuria, and pyuria.

Rectal examination reveals a nodular, elastic gland, usually affected on one side only, and differing from a carcinomatous condition in that it lacks the board-like consistency usually associated with the latter. The secretion may show tubercle bacilli. Differential diagnosis is based chiefly on microscopic study of a specimen of diseased tissue.

Treatment. The hygienic, dietary, and therapeutic measures advocated for postoperative and inoperable tuberculosis of the urogenital tract are usually prescribed, and good results have been obtained by us therefrom in some cases. When calcium deposits are present, total prostatectomy is indicated. On the other hand, in acute and subacute tuberculosis of the prostate, operation is distinctly contraindicated. Even in the presence of abscess, it is preferable to allow it to absorb or rupture into the urethra rather than to evacuate it through the perineum, as this is likely to result in a persistent fistula. Radical removal of the genital tract is inadvisable in patients with extensive involvement of the prostate gland.

CYSTS OF THE PROSTATE GLAND

Cysts of the prostate gland are decidedly rare. They may be either congenital or acquired. The most common is the simple retention cyst,

which may arise in any portion of the gland and is merely a normal acinus the duct of which has become occluded, causing expansion of the acinus.

Treatment. Smaller retention cysts, producing no symptoms, are best left alone. When treatment is necessary, destruction of the cyst by fulguration, or removal by prostatic resection instruments, is the treatment of choice.

PROSTATIC CALCULUS

Incidence and Etiology. Prostatic calculi are relatively common. In an autopsical study of 250 prostates from subjects of all ages, I found one or more stones in approximately one-fifth of the glands.

Prostatic calcuosis may occur at any period of life, but is rare before the age of 30 years. Of the twenty-three patients reported on by Lowsley and Hawes, only one was under 40 years of age.

Distinction must be made between (1) endogenous, or true prostatic calculi, namely, concretions formed within the prostatic substance, and (2) exogenous, or false calculi, which are urinary stones that have lodged in the prostatic urethra or have formed primarily from urinary sediments in a communicating pouch. The nucleus of a true prostatic stone is composed of organic material of an albuminoid nature: corpora amylacea, a blood clot, epithelial detritus, a clump of bacteria, or necrotic tissue from an abscess. The inorganic element forming the laminated layers about the nucleus is composed of inorganic salts.

The exact etiology of true prostatic stones is unknown. The most commonly held theory is that first advanced by Thompson in 1868, namely, that they have their origin in corpora amylacea, which, under certain conditions, act as foreign bodies and set up an inflammatory reaction in the mucous membrane of the acini enclosing them, as a result of which calcium phosphates and carbonates are cast off; these impregnate the corpora amylacea and convert them into calculi.

Pathology. True prostatic calculi are usually multiple, small, rounded (without facets), and scattered indiscriminately throughout the parenchyma. Occasionally a cluster of stones will be found in one lobe while the remaining lobes are free of calculi. Sometimes there will be a single large stone, or one large stone in association with numerous smaller ones.

Microscopically, the portion of the gland containing the calculi

shows distended acini, the mucosal linings of which are infiltrated by lymphocytes or by polymorphonuclear leukocytes.

Benign adenomatous hypertrophy and prostatic calculosis not infrequently occur together (18 of 23 cases, Lowsley and Hawes). The calculi are seldom, if ever, located within the adenoma, but are found between it and the capsule, embedded in the remnants of the true prostate. Frequently, however, calculi-containing prostates show no sign of hypertrophy. They may be senile and fibrotic, with atrophy of the parenchyma and evidence of inflammation.

Symptoms and Diagnosis. The most important symptoms are disturbances of urination, the actual passage of calculi either spontaneously or following massage, and localized or referred pain—in the perineum, suprapubic region, rectum, or down the penile shaft. In many cases the symptoms are overshadowed by those of an associated hypertrophy or prostatitis. In others, no symptoms are present, and the stones are discovered accidentally.

It is frequently possible to make a presumptive diagnosis of prostatic calculi by the rectal palpation of a hard, circumscribed area suggestive of stone or a nodule, or by the eliciting of crepitation. Urethroscopic examination may reveal the presence of stones in the prostatic ducts. Positive diagnosis is made by roentgenography. Cysto-urethrograms are of value not only in revealing the calculi, but in determining the type and degree of obstruction to urination, and associated pathology, if present.

Treatment. Small calculi, that are discovered accidentally and give no subjective symptoms, are best left alone. In older men, who have neared the end of sexual life, we prefer to treat prostatic calculosis by total prostatectomy, both when there is associated adenomatous hypertrophy and when there is no hypertrophy but infection and fibrosis are present. Prostatotomy, transurethral resection, and even the usual conservative perineal or suprapubic prostatectomy often leave enough calculi or infected prostate to cause persistence or recurrence of symptoms, as has been repeatedly demonstrated by postoperative roentgenograms. Younger men with numerous stones in their prostates should be treated by prostatectomy as a rule. Transurethral resection is also frequently employed, but has the disadvantage that stones are often left behind in the prostate.

SARCOMA OF THE PROSTATE

Sarcoma of the prostate is relatively rare, and may occur at any age. A review of the literature by Lowsley and Kimball, in 1934, disclosed only 132 reported cases, 35 of which occurred in patients under 22 years of age. These tumors usually grow rapidly and attain large size, early infiltrating the bladder, seminal vesicles, and rectum. Growth of the tumor backward beneath the base of the bladder pushes the latter upward and forward, causing obstruction of the ureteral orifices, urethral orifice, and urethra, with resultant partial or complete retention. Growth of the tumor toward the perineum causes prolapse of the rectum, with obstruction to defecation and urination.

Diagnosis. Early diagnosis is essential. In early cases rectal examination may be negative, but usually reveals a palpable nodule. Occasionally the growth may be indurated and nodular, but usually it is of uniform consistency and has an elastic "balloon-like" feel; hence the condition may be erroneously diagnosed as abscess. The diagnosis can positively be made by needle biopsy.

Prognosis and Treatment. The prognosis is poor. The most favorable results have been achieved through the use of radium and Roentgen rays. In early cases, the skilled use of these agents may prove curative, and in late cases they may give relief and prolong life. Operative intervention should be limited to the relief of obstruction and the treatment of complications.

CARCINOMA OF THE PROSTATE GLAND

Carcinoma of the prostate, because of its frequency and its essentially fatal nature, presents the urologist with his most baffling problem. Young's statistics (1935) reveal that a fifth of the male patients who seek relief of obstruction of the vesical neck have carcinoma of the prostate.

Pathology. A striking morphologic peculiarity of carcinoma of the prostate gland, that has been emphasized by most authors, is the diversity of its forms. In the same case, in different portions, the carcinomatous proliferation may be found at one time as an adenocarcinoma and again as a scirrhous, a medullary, or a squamous-cell carcinoma.

A large percentage of prostatic carcinomas are associated with benign hypertrophy. In only 10 (13 per cent) of the 72 cases studied by Wilson and McGrath was there no evidence of associated hypertrophy.

CHART I
INCIDENCE, BY AGE-GROUPS, OF CARCINOMA IN RELATION TO BENIGN
ENLARGEMENT IN 280 CASES

Age of group	Prostates examined	Per cent showing carcinoma	Per cent showing benign enlargement	Per cent of carcinomas which arose in a prostate with benign enlargement	Per cent of benign enlargement which also showed carcinoma
31-40	28	0%	4% (1)	0%	0%
41-50	23	17% (4)	30% (7)	25%	14%
51-60	65	14% (9)	37% (24)	50%	21%
61-70	77	23% (18)	67% (52)	66%	23%
71-80	63	21% (13)	68% (43)	46%	14%
81-90	24	29% (7)	75% (18)	71%	27%

In his very complete study of 280 prostates from men between the ages of 31 and 90 years, Robert A. Moore found the occurrence of carcinoma and benign enlargement to be as shown in Chart I. It is evident, therefore, that the possibility of carcinoma must be kept in mind in every case of prostatic hypertrophy.

Numerous careful studies show that in over 75 per cent of cases the carcinoma starts in the posterior lobe (the portion of the gland which does not participate in benign adenomatous hypertrophy).

Prostatic carcinoma is, as a rule, insidious and slow-growing, though highly malignant, and may remain confined to the prostate and periprostatic region for long periods. Only 10 to 20 per cent, according to Barringer, are radiosensitive.

In many cases, by the time the growth has become sufficiently advanced to be clinically diagnosed, it has extended beyond the posterior lobe into the lateral and median lobes and upward to the base of the prostate. There it may penetrate the capsule and involve the seminal vesicles. Through the prostate's rich supply of lymphatics, the carcinoma may extend to the pelvic nodes, or, by the perirectal plexus, to the abdominal nodes. Dissemination through the blood stream may occur early, and distant metastases, particularly in the bones, are often detected before the occurrence of local symptoms. The small prostatic tumor often disseminates widely. The high frequency of skeletal metastases, and the predilection for the pelvis and lumbar vertebrae, have been noted by practically all observers.

Symptoms. The symptoms are not characteristic. Disturbances of urination are usually the first symptoms, but advanced carcinoma may

be present without urinary symptoms. Pain—referred to the sacroiliac region, rectum, perineum, or suprapubic area—is often an early symptom, and may be due to metastases to the bones. Terminal hematuria, retention, loss of weight and strength, and constipation are significant, but late, symptoms.

Diagnosis. Carcinoma of the prostate has, unfortunately, usually existed for a long period by the time it is recognized. The diagnosis is based upon the findings of rectal palpation and microscopic examination of a biopsy specimen removed by means of an instrument, such as the Lowsley biopsy instrument. In well-advanced cases recognition is usually not difficult; but in early cases, in the soft (medullary) type of carcinoma, and in carcinoma superimposed upon a benign hypertrophy, diagnosis may be difficult. A single, small nodule may easily escape notice, especially when masked by edematous prostatic tissue or in the absence of symptoms. The entire gland may be irregularly enlarged, of a board-like hardness, and fixed; but usually the growth is in the form of a nodule or hardened area in the posterior lobe, where it is readily palpable by rectum. Evidence of the fixed gland may be seen on cystourethroscopic examination.

Prognosis and Treatment. The prognosis in the past has been cheerless in the extreme. Over 95 per cent of the cases are beyond cure when first seen. The high early incidence of pelvic lymphadenopathy, capsular infiltration and invasion of the contiguous structures, and skeletal metastases precludes the successful surgical treatment of the disease in most cases.

In cases in which the carcinoma is confined to the prostate and periprostatic region, total or subtotal perineal prostatectomy yields a fair percentage of cures estimated upon a 3 to 5 years' basis, and prolongations of life for considerably longer periods are not uncommon. If seen too late for hope of radical removal, partial perineal prostatectomy, or transurethral resection of the obstruction, with implantation of radon seeds, is the method of choice.

Improvement in prognosis is dependent on an increase in the number of early diagnoses, with radical removal.

BENIGN HYPERTROPHY OF THE PROSTATE

Benign hypertrophy of the prostate gland occurs in from one-third to one-fifth of all men over 50 years of age.

Etiology. Many theories have been advanced as to why the prostate tends to hypertrophy with age. The chief are: (1) that the hypertrophy is due to true tumor formation, which takes its origin, according to some, from the periurethral accessory glands, or, according to others, from any part of the prostate gland proper; (2) that it is a fibroepithelial growth akin to myoma of the uterus; (3) that the condition is a cystic glandular hyperplasia having its basis in infection of long standing; (4) that the hyperplasia is endocrinopathic, and due to an improper balance between the male and female hormones.

Pathology. Benign hypertrophy of the prostate most frequently occurs in the middle and lateral lobes—the anterior lobe being affected rarely, and the posterior lobe practically never. My studies show that the portion which enlarges most frequently is really a contiguous structure—the subcervical group of tubules. These may enlarge without hypertrophy of the prostate; but when the prostate proper is enlarged, the subcervical group will also be hypertrophied. If a portion of the gland protrudes into the bladder, it will usually be found to be the subcervical group of tubules.

Microscopically, four types of benign enlargement may be distinguished: glandular, cystic, fibroglandular, and fibrous. The much-discussed question as to whether adenomas or fibromyomas predominate in prostatic hypertrophy is of little practical importance as it is established that a pure formation of either type never occurs.

In prostatic hypertrophy there is a definite line of cleavage between the capsule and the prostatic tissue, making separation of the adenomatous prostate from the capsule an easy matter.

Symptoms. Enlargement of the prostate is usually an insidious disease, which develops slowly and is marked by gradually increasing frequency and nocturia. The patient notices that the character of the stream changes: it is often slow in starting, and lacks force. Men take this as evidence of advancing age and often pay little attention to it. The condition gradually gets worse, and is usually accompanied by urinary infection. Often microscopic blood is present, and occasionally macroscopic hematuria. In the rare case, complete obstruction of urination may occur without any premonitory symptoms.

The urine usually contains pus, blood, and albumin. If the disease is of long standing, casts are found, and the phenolsulphonphthalein test will show diminished renal function. The blood urea is increased, some-

times very greatly; but unless there is fever, the blood count is usually within normal limits.

Diagnosis. The patient should be given a careful general and special examination, including rectal palpation, an estimation of the amount of residual urine, determination of the renal function, and a cystoscopic examination to ascertain the exact nature of the enlargement. The size of the prostate as felt by rectum has nothing to do with its obstructiveness, and cystoscopy, or cysto-urethrography, is essential to determine the extent of the intravesical and intraurethral intrusion.

Treatment. Many patients with benign hypertrophy of the prostate have no obstructive symptoms and do not require surgery. In benign hypertrophy without residual urine, *palliative treatment* is usually advisable; this consists of periodic prostatic massage, urethral dilatations, urethrovessical irrigations, the application of heat to the prostate, and hydrotherapy. Periodic check-up is essential.

Hormonal therapy affords symptomatic relief in some early cases of prostatism with slight or moderate urinary disturbances; but even its most enthusiastic advocates do not claim that it benefits all types of cases, or that it is to be considered a substitute for surgical relief in major prostatic obstruction.

Roentgen therapy of benign hypertrophy also is an accepted procedure, but opinions vary as to the effect of such treatment. The more conservative urologists and radiotherapists incline to the opinion that the only effects of irradiation are a definite alleviation of the associated congestion and edema, giving temporary relief in selected cases. It cannot, however, be regarded as a substitute for prostatectomy or resection.

Surgical treatment is usually required in cases with residual urine. Every patient presents an individual problem, and the type of operation selected should be the one best suited to the case in question. It has always been our contention that every well-trained urological surgeon should be psychologically and technically equipped to perform any operation in urology. To that end, we train our young men in the proper technique of perineal, suprapubic, and transurethral prostatectomy. Each of these has its place in urological surgery. By limiting his surgery to one of these methods only, the operator limits his usefulness to his patients.

Widespread interest has been manifested in the past two decades, by both the medical profession and the laity, in transurethral resection of

the prostate. In 1913, Hugh Young developed a method of transurethral surgery for certain types of enlargement of the subcervical group of tubules. This operation, called the Young punch operation, did more efficiently and less dangerously what the Italian Bottini operation (performed through an external urethrotomy wound) was designed to do. Young's operation was modified and improved, in 1920, by the late John Caulk, of St. Louis, who added a cauterizing element. In 1926, at The New York Academy of Medicine, Maximilian Stern presented a resection instrument made for him by the late Rheinold Wappler. This instrument was too small to be entirely effective, but it was soon improved by Bumpus, Collings, McCarthy, Foley, Kirwin, and others.

A tremendous wave of enthusiasm swept this country and extended abroad, and for a time claims were made to the effect that open surgery upon the prostate gland was doomed to oblivion. As the fanaticism subsided, there also died down the extravagant claims that transurethral surgery was an office procedure, and that any prostate of any size could be removed without the preliminary preparation of the patient which had reduced the mortality of the open operation from nearly 50 per cent to about 6 per cent. It soon became evident that this surgical maneuver was not as simple as it had at first seemed. One great harm done by its too ardent protagonists was that their claims gave every doctor who could manipulate a cystoscope the idea that he could perform the transurethral operation. Such, of course, was not the case, and the mortality of these amateur surgeons was tremendous.

Transurethral resection has a permanent and highly important place in surgery of the vesical neck, and with the passage of time its scope and limitations are being better defined. It is true that the method has a slightly geographic aspect; most of those who believe in transurethral prostatectomy to the exclusion of the open operation, it has been noted, live in the Midwest.

Before deciding which operation to perform in a given case, one must determine the type of enlargement present. In general, it is our practice to remove by means of *transurethral resection* all enlargements of the middle lobe and of the subcervical group of tubules, all fibrous bars, and certain obstructions due to malignancy of the prostate. We prefer to use the Kirwin rotary resectoscope as a rule.

If the enlargement of the gland is mainly intravesical, *suprapubic prostatectomy* is the method of choice. The operation employed is the

so-called Fuller-Freyer technique. In this procedure, the capsule over the most prominently presenting part of the gland is incised, and from this point the enucleation is accomplished. Care is taken not to split the anterior commissure as by so doing one often tears into the plexus of Santorini on the anterior surface of the prostate, greatly increasing the bleeding.

In all other cases, *perineal prostatectomy* is done. This includes enlargements which encroach on the posterior urethra. Prostatectomy for the removal of a malignant gland, or for long-standing chronic inflammation, is also accomplished through the perineum. A recent modification of the usual perineal prostatectomy, by the author, has reduced postoperative incontinence of urine to a minimum. This consists in plicating the membranous urethra just external to the apex of the prostate by the insertion of a mattress suture of ribbon gut.

Recently, patients suffering from enlargement of the prostate, who have passed the period of sexual activity, have been operated upon by means of a *subtotal prostatectomy*, which is accomplished as follows: The prostate gland is exposed by the perineal route in the usual manner. The lateral surfaces of the gland are exposed, which is usually easily accomplished as there are seldom any adhesions from these aspects of the organ. The apex is then cut across and the entire gland and capsule excised except for a small strip of the anterior commissure. The seminal vesicles and ampullae of the vasa deferentia are cut across. The neck of the bladder is brought in contact with the membranous urethra by means of a mattress suture which not only approximates these structures and plicates the urethra, but stops all bleeding as well, thus doing away with the necessity of packing.

Our results with this modified perineal operation are so good that we perform it by choice unless the patient is still active sexually. In the latter case, it is unwise to do this procedure as the seminal vesicles and ampullae of the vasa deferentia are cut across, and ejaculation is impossible.

Preliminary preparation of the patient is of the greatest importance irrespective of the type of operation selected. This consists primarily of properly managed drainage, which is accomplished either by (1) a suprapubic cystostomy, with suction drainage, or (2) an indwelling urethral catheter.

Complications in prostatectomy by any of the three techniques men-

CHART II
OPERATIONS FOR BENIGN AND MALIGNANT HYPERTROPHY OF THE PROSTATE GLAND
Dec. 10, 1920—Jan. 1, 1941

	Age Groups				Hospitalization		Results		Mort. Rate	Total Cases
	-50	51-60	61-70	71-80	80.	Short-est	Long-est	Average		
PERINEAL PROSTATECTOMY										
Benign prostates	21	197	309	128	17	1	148	24	617	55
Malignant prostates	2	20	46	22	4	4	106	27	81	13
SUBTOTAL AND TOTAL PERINEal, PROSTATECTOMY										
Benign prostates	2	18	16	8		2	60	25	42	2
Malignant prostates	2	4	14	1		5	125	31	18	3
SUPRAPUBIC PROSTATECTOMY										
Benign prostates	4	35	74	25	4	1	90	25	128	14
Malignant prostates		1	1	3	1	4	17	20	4	2
TRANSURETHRAL RESECTION										
Benign prostates	92	174	189	88	11	1	77	10	523	9
Malignant prostates	6	11	20	17	1	1	165	17	48	1
YOUNG PUNCH OPERATION										
Benign prostates	18	18	16	3		1	58	7	52	3
KIRWIN SHRINKAGE OPERATION										
Benign prostates	3	2	3	2	1	2	38	12	7	4
										0
TOTALS	150	480	688	297	39				1520	14
										120
										7.2%
										1654

SUMMARY:	Total Cases	Died	Mort. Rate
Benign	1478	96	6.49%
Malignant	176	24	13.63%
Total	1654	120	7.25%

tioned are approximately the same. The mortality rate is lower in trans-urethral prostatectomy than in the suprapubic and perineal procedures because the large majority of these operations are done on much younger men.

Chart II shows the results of these various procedures, in both benign and malignant enlargements, in the Department of Urology (James Buchanan Brady Foundation) of the New York Hospital.

SUMMARY

Attention is called to the effect of disease of the prostate gland in the young as well as the old.

Young men are liable to acute and chronic inflammation of the prostate, sometimes producing abscess, requiring surgery, but more often causing low back pain, urinary disturbances, and sexual disturbances. Non-surgical treatment is indicated in the latter; this consists of massage, urethral dilatation, urethrovesical irrigations, chemotherapy, hydrotherapy, diathermy, and other forms of physiotherapy. Tuberculosis of the prostate occurs fairly frequently in young men, and is usually part of a progressive urogenital tuberculosis. Treatment, as a rule, is non-surgical. Sarcoma of the prostate, a rare disease that is almost invariably fatal, affects young men and even children relatively often.

Appropriate diet and medication are indicated in all prostatic conditions.

Older men are subject to prostatic calculosis, and all forms of obstructive prostatism, both benign and malignant. Appropriate surgical methods must be applied after careful investigation has revealed the exact conditions that prevail.

In less than 5 per cent of cases of carcinoma of the prostate gland is the malignancy discovered in time to effect a cure by total extirpation. This is because there are no symptoms in early stages of the disease. It is therefore an important duty of the general practitioner and the family doctor to do a rectal examination on every male patient over 50 years of age, and to investigate thoroughly every case in which the prostate is not perfectly normal.